

***Interactive comment on “Assessing impacts of climate change, sea level rise, and drainage canals on saltwater intrusion to coastal aquifer” by P. Rasmussen et al.***

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Scientific Significance:

Good;

- Combination of existing interesting concepts (skyTEM, SEAWAT model etc) in a practical case study. The article shows that a good understanding of the geohydrological system can help an area to become self-sufficient in its fresh water supply, even when the sea level rises or the groundwater recharge decreases.

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- I miss the up scaling to other areas: what information do we need and what information is just interesting (what kind of measurements for example and measurements vs model) to implement the solution (the practical question of climate proof groundwater extractions) in other areas.

- What is the concrete solution for this area (in terms of m<sup>3</sup>/year, location extractions, optimization of the system)? Who is going to implement that solution? Why or why not?

Scientific Quality:

Fair / good: As described in the discussion (but missing in the results): calibration of the model is only done with head measurements. The differences in chloride concentration / fresh water lens between the model and the (skyTEM) measurements (fig 7) is quite large. If infiltration/seepage fluxes in the model are not corresponding with the current field data, it is hard to predict the influence of sea level rise. Sea level rise can cause more seepage or a henge area from infiltration to seepage with salinisation as a result.

- Can you give a better/complete comparison between the chloride interfaces model and measurements?

- Additional calibration of the model with the skyTEM and borehole measurements will increase the reliability of your model.

- Or can you maybe include in the discussion what parameters are likely to change in what direction after calibration by using the new measurements?

Presentation Quality:

Good: The article is well written, nice to read with clear figures. The authors are clear about the calibration process and assumptions.

Comments and questions:

- P 7973: can you indicate the location of Boto Nor and the Marrebaek on figure 2?

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- P 7974: can you include a cross-section of the geology (figure) including depth?
- P 7976 first half: what is the yearly mean groundwater recharge in m<sup>3</sup>/yr for the model area and the whole area compared to the pumping m<sup>3</sup>/yr (is there enough water?)?.
- P. 7983: is there no change in sea level rise between the phases 1-4? Is that realistic or why did you use this assumption?
- P. 7983: no flow boundary is used along the outer boundaries. Is there for example no outflow on the western boundary and no inflow on the northern boundary (bases on the elevation map fig 2)?
- P. 7985: Can you explain why there is almost no difference in the residual error between a with and a without density model?
- P. 7985: what were the main changes in the parameters before and after calibration?
- P. 7988: large difference is depth 150 mgl-1 interface measurements and model. See comments at 'scientific quality'.
- P 7995: line 16: more than 100 yr; this is not shown in the table / measurements?
- P 7995 / table 9: the 3H/3He age in years is constant for all wells (>75 yr), except 1 well (75 yr). What does > 75 mean, can it be much more than 75 yr? Why can you compare those constant values with the simulated travel times?
- Table 6: hydraulic conductivity clay and chalk is quite large (5\*10<sup>6</sup> m/s)

Small notes:

P. 7971 first line: 'patterns. This will challenge' instead of 'patterns will challenge'

P. 7972 l (=line) 5: remains

P. 7972 l 6: wedge is

P. 7974 l15: ground surface is

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P. 7976 l 25: name in figure 5 is just 179, can you make this consistent?

P. 7976 l 27: 242.44B in not on the map

P. 7981 l 12: talbe 1 refers to 6 model phases, not to climate scenarios

P. 7985: can 4.4 be a part of 4.3?

P. 7994 l 7: shows

References: Sanchez et al 2012 is missing

Figure 7: orientation west-east and south-north?

Figure 9 b: too small

Figure 11 d: this is scenario 1 instead of 0?

Figure 11 d text: row 68 instead of 62

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